

I CLAIM:

1    - 1. A method for mounting a protuberant conductive contact to an  
2    electronic component, the method comprising sequential steps  
3    of:

4                 providing a wire having a continuous feed end,  
5                 intimately bonding the feed end to the component,  
6                 forming from the bonded feed end a stem which protrudes  
7                 from the component and has a first stem end thereat,  
8                 severing the stem at a second stem end to define a  
9                 skeleton,  
10                depositing a conductive material to envelope the skeleton  
11                and adjacent surface of the component.

1    2. The method as claimed in Claim 1, and immediately before the  
2    severing step intimately bonding the second stem end to the  
3    component.

1    3. A method for mounting a protuberant conductive contact to an  
2    electronic component, the method comprising sequential steps  
3    of:

4                 providing a wire having a continuous feed end,  
5                 intimately bonding the feed end to the component,  
6                 forming from the bonded feed end a stem which protrudes  
7                 from the component and has a first stem end thereat,

8            severing the stem at a second stem end to define a  
9            skeleton,

10            depositing a conductive material to jacket the skeleton  
11            and adjacent surface of the component.

1        4. The method as claimed in Claim 1, and immediately after the  
2            severing step, continuing sequentially the bonding step and  
3            the forming step and the severing step for a predetermined  
4            number of stems to comprise the skeleton.

5        5. The method as claimed in Claim 4, and immediately before each  
6            of the severing steps each of the second stem ends is inti-  
7            mately bonded to the component.

1        6. A method for mounting a protuberant conductive contact to a  
2            conductive terminal on an electronic component, the method  
3            comprising sequential steps of:

4            providing a wire having a continuous feed end,

5            intimately bonding the feed end to the terminal,

6            forming from the feed end a stem which protrudes from the  
7            terminal and has a first stem end thereat,

8            severing the stem at a second stem end to define a  
9            skeleton,

10            depositing a conductive material to envelop the skeleton  
11            and adjacent surface of the terminal.

1       7. The method as claimed in Claim 6, and immediately before the  
2 severing step intimately bonding the second stem end to the  
3 terminal.

1       8. The method as claimed in Claim 6, and immediately after the  
2 severing step, continuing sequentially the bonding step and  
3 the forming step and the severing step for a predetermined  
4 number of stems to comprise the skeleton.

1       9. The method as claimed in Claim 8, and immediately before each  
2 of the severing steps each of the second stem ends is inti-  
3 mately bonded to the terminal.

1       10. A method for mounting a protuberant conductive contact to a  
2 conductive terminal on an electronic component, the method  
3 comprising sequential steps of:

4                 providing a wire having a continuous feed end,  
5                 intimately bonding the feed end to the terminal,  
6                 forming from the bonded feed end a stem which protrudes  
7                 from the terminal and has a first stem end thereat,  
8                 severing the stem at a second stem end to define a  
9                 skeleton,

10                 depositing a conductive material to jacket the skeleton  
11                 and adjacent surface of the terminal.

- 1       11. The method as claimed in Claim 10, and immediately before the  
2           severing step intimately bonding the second stem end to the  
3           terminal.
- 1       12. The method as claimed in Claim 10, and immediately after the  
2           last mentioned severing step continuing sequentially the  
3           bonding step and the forming step and the severing step for a  
4           predetermined number of stems to comprise the skeleton.
- 1       13. The method as claimed in Claim 12, and immediately before each  
2           of the severing steps each of the second ends is intimately  
3           bonded to the terminal.
- 1       14. A method for mounting a protuberant conductive contact to a  
2           conductive terminal on an electronic component, the method  
3           comprising sequential steps of:  
4                 providing a wire having a continuous feed end,  
5                 intimately bonding the feed end to the terminal,  
6                 forming from the bonded feed end a stem which protrudes  
7                 from the terminal and has a first stem end thereat,  
8                 intimately bonding a second stem end to the terminal,  
9                 sequentially continuing the forming step and the bonding  
10               step for a predetermined number of times,  
11                 after the last bonding step severing the stem to define  
12               a skeleton,

13                   depositing a conductive material to envelop the skeleton  
14                   and adjacent surface of the terminal.

1       15. A method for mounting a protuberant conductive contact to a  
2                   conductive terminal on an electronic component, the method  
3                   comprising sequential steps of:

4                   providing a wire having a continuous feed end,  
5                   intimately bonding the feed end to the terminal,  
6                   forming from the bonded feed end a stem which protrudes  
7                   from the terminal and has a first stem end thereat,  
8                   bonding a second stem end to a sacrificial member mounted  
9                   in spaced relationship from the component,  
10                  severing the stem at the second stem end to define a  
11                  skeleton,  
12                  depositing a conductive material to envelop the skeleton  
13                  and at least adjacent surface of the component,  
14                  eliminating the sacrificial member.

1       16. The method as claimed in Claim 15, wherein during the elimi-  
2                  nating step the second stem ends are severed from the sacri-  
3                  ficial member.

1       17. The method as claimed in Claim 6, 7, 8, 9, 14 or 15, performed  
2                  on a plurality of the terminals on the electronic component.

- 1       18. The method as claimed in Claim 17, performed on a plurality of  
2                  wires on a plurality of the terminals on the electronic  
3                  component.
- 1       19. The method as claimed in Claim 17, with the bonding performed  
2                  by applying at least one of a group consisting of superambient  
3                  pressure, superambient temperature and ultrasonic energy.
- 1       20. The method as claimed in Claim 17, wherein the severing is  
2                  performed by melting the wire.
- 1       21. The method as claimed in Claim 17, wherein the forming steps  
2                  and the severing steps are performed by a wirebonding appara-  
3                  tus, and after the severing steps but before the depositing  
4                  step shaping the skeleton by means of a tool external to the  
5                  apparatus.
- 1       22. The method as claimed in Claim 17, wherein the severing of the  
2                  second ends is performed by mechanical shearing.
- 1       23. The method as claimed in Claim 17, wherein during the forming  
2                  step the shape of the stems is determined by means of a  
3                  software algorithm in a control system of an automated  
4                  wirebonding apparatus.

- 1       24. The method as claimed in Claim 6, 7, 8, 9 or 15, performed on  
2            a plurality of the terminals, wherein shape of the skeleton  
3            and mechanical properties of the conductive material are  
4            organized collectively to impart resilience to the protuberant  
5            conductive contact.
- 1       25. The method as claimed in Claim 24, wherein the conductive  
2            material is provided with a multitude of microprotrusions on  
3            its surface.
- 4       26. The method as claimed in Claim 17, with the depositing step  
5            including placement of a plurality of layers each differing  
6            from one another.
- 1       27. The method as claimed in claim 24, wherein the depositing step  
2            includes placement of a plurality of layers each differing  
3            from one another.
- 1       28. The method as claimed in Claim 27, wherein at least one of the  
2            layers comprising conductive material has a jagged topography  
3            in order to reduce contact resistance of the protuberant  
4            conductive contact when mated to a matching terminal.
- 1       29. The method as claimed in Claim 17 or 24, wherein the  
2            deposition is performed by means of electrochemical plating in  
3            an ionic solution.

- 1       30. The method as claimed in Claim 6 or 8, performed on a plurali-  
2       ty of the terminals and, wherein:  
3                  the forming steps result in a plurality of free-standing  
4                  protuberant stems,  
5                  the severing steps are performed on the respective stems  
6                  all in a common plane.
- 1       31. The method as claimed in Claim 6 or 8, performed on a  
2       plurality of the terminals on at least one electronic  
3       component and, wherein:  
4                  the terminals are in different planes,  
5                  the forming steps result in a plurality of free-standing  
6                  protuberant stems,  
7                  the severing steps are performed on the respective stems  
8                  all in a common plane.
- 1       32. The method as claimed in Claim 6 or 8, performed on a  
2       plurality of the terminals on at least one electronic  
3       component, wherein shapes of the skeleton and mechanical  
4       properties of the conductive material are organized  
5       collectively to impart resilience to the protuberant  
6       conductive contacts, and the severing steps are performed on  
7       the stems all in a common plane.
- 1       33. The method as claimed in Claim 17 or 24, wherein the cross-  
2       sectional area of the wire is rectangular.

- 1       34. The method as claimed in Claim 26 or 27, wherein the wire is  
2                  made of a metal selected from a group consisting of gold,  
3                  silver, beryllium, copper, aluminum, rhodium, ruthenium,  
4                  palladium, platinum, cadmium, tin, lead, indium, antimony,  
5                  phosphorous, boron, nickel, magnesium and alloys thereof, and  
6                  wherein at least one of the layers of the conductive material  
7                  is a metal selected from a group consisting of nickel,  
8                  phosphorous, boron, cobalt, iron, chromium, copper, zinc,  
9                  tungsten, tin, lead, bismuth, indium, cadmium, antimony, gold,  
10                 silver, rhodium, palladium, platinum, ruthenium and alloys  
11                 thereof.
- 1        35. The method as claimed in Claim 6, 7, 8, or 14, performed on at  
2                  least one terminal on an electronic component, wherein the  
3                  wire is made primarily of a metal selected from a group  
4                  consisting of gold, copper, aluminum, silver, lead, tin,  
5                  indium and alloys thereof; the skeleton is coated with a first  
6                  layer of the conductive material selected from a group  
7                  consisting of nickel, cobalt, boron, phosphorous, copper,  
8                  tungsten, titanium, chromium, and alloys thereof; a top layer  
9                  of the conductive material is solder selected from a group  
10                 consisting of lead, tin, indium, bismuth, antimony, gold,  
11                 silver, cadmium and alloys thereof.

- 1       36. The method as claimed in Claim 26 or 27, wherein a layer  
2           reactive with material of the wire is interposed between the  
3           skeleton and the conductive material.
- 1       37. The method as claimed in Claim 26 or 27, wherein the wire is  
2           gold and the reactive layer is tin.
- 1       38. An electronic component a first and a second surface in which  
2           on at least one of the surfaces is provided a plurality of the  
3           terminals having protuberant conductive contacts mounted  
4           thereto and made by means of the method as claimed in any of  
5           Claims 6, 7, 8, 14, 15 or 34.

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